Claims

What is claimed is:

1.   A monitoring system for use in estimating the existence of cavitation in a device, the monitoring system comprising:

a processor;

a memory that stores a characteristic curve for the device;

a collection routine adapted to be executed on the processor to collect one or more operating parameters associated with the device during operation of the device; and

a monitoring routine adapted to be executed on the processor that uses the one or more operating parameters and the characteristic curve to estimate the presence of cavitation within the device.

2.   The monitoring system of claim 1, wherein the memory also stores a model associated with the device and wherein the monitoring routine is adapted to use the model to estimate a further operating parameter associated with the device.

3.   The monitoring system of claim 2, wherein the monitoring routine is further adapted to use the estimated further operating parameter and the characteristic curve for the device to estimate the presence of cavitation within the device.

4.   The monitoring system of claim 1, wherein the one or more operating parameters includes a pressure indication associated with the device and wherein the collection routine is adapted to collect the pressure indication.

5.   The monitoring system of claim 4, wherein the one or more operating parameters includes a suction pressure indication.

6.   The monitoring system of claim 1, wherein the one or more operating parameters includes a fluid flow indication associated with the device and wherein the collection routine is adapted to collect the fluid flow indication.

7.   The monitoring system of claim 6, wherein the one or more operating parameters includes a suction fluid flow indication.

8.   The monitoring system of claim 1, wherein the one or more operating parameters includes a pressure indication and a fluid flow indication associated with the device and wherein the collection routine is adapted to collect the pressure and fluid flow indications.

9.   The monitoring system of claim 8, wherein the one or more operating parameters includes a suction pressure indication and a suction fluid flow indication.

10.   The monitoring system of claim 1, wherein the monitoring routine is adapted to determine a net positive suction head available in the device and compare the net positive suction head available with a net positive suction head required associated with the device.

11.   The monitoring system of claim 10, wherein the monitoring routine is further adapted to calculate the ratio of the net positive suction head available and the net positive suction head required for the device and to compare the ratio to a predetermined threshold.

12.   The monitoring system of claim 1, wherein the monitoring routine is adapted to alert a user when the monitoring routine estimates the presence of cavitation within the device.

13.   The monitoring system of claim 1, wherein the characteristic curve defines a net positive suction pressure required for the device.

14.   The monitoring system of claim 1, wherein the characteristic curve is a voltage-current characteristic curve for the device, wherein the one or more operating parameters are associated with electrical operating parameters of the device and wherein the monitoring routine is adapted to use the electrical operating parameters of the device to detect whether the device is operating in accordance with the voltage-current characteristic curve of the device.

15.   The monitoring system of claim 14, wherein the voltage-current characteristic curve is a voltage-current characteristic curve for the device operating without cavitation.

16.   The monitoring system of claim 14, wherein the voltage-current characteristic curve is a voltage-current characteristic curve for the device operating with cavitation.

17.   The monitoring system of claim 14, wherein the voltage-current characteristic curve is a voltage-current characteristic curve for the device including high frequency fluctuations.

18.   The monitoring system of claim 1, wherein the monitoring routine includes an expert engine.

19.   The monitoring system of claim 18, wherein the expert engine is a neural network.

20.   A method of detecting cavitation within a device operating in a process, the method comprising:

collecting one or more operating parameters associated with the device during operation of the device; and

automatically detecting the presence of cavitation within the device based on the one or more collected operating parameters.

21.   The method of claim 20, further including the step of storing a characteristic curve for the device and wherein the step of automatically detecting includes the step of using the characteristic curve.

22.   The method of claim 21, wherein the step of automatically detecting includes the step of using a model associated with the device to estimate a further operating parameter associated with the device.

23.   The method of claim 22, wherein the step of automatically detecting includes the step of using the estimated further operating parameter and the characteristic curve for the device to detect the presence of cavitation within the device.

24.   The method of claim 21, wherein the step of collecting includes the step of collecting an indication of a pressure associated with the device.

25.   The method of claim 21, wherein the step of collecting includes the step of collecting an indication of a fluid flow associated with the device.

26.   The method of claim 21, wherein the step of automatically detecting includes the steps of determining a net positive suction head available in the device and comparing the net positive suction head available with a net positive suction head required for the device.

27.   The method of claim 26, wherein the step of automatically detecting further includes the step of calculating the ratio of the net positive suction head available and the net positive suction head required for the device and comparing the ratio to a predetermined threshold.

28.   The method of claim 21, further including the step of alerting a user when cavitation is detected within the device.

29.   The method of claim 21, wherein the step of storing a characteristic curve includes a step of storing a characteristic curve that defines a net positive suction pressure required for the device.

30.   The method of claim 21 wherein the step of storing the characteristic curve includes the step of storing a voltage-current characteristic curve for the device, wherein the step of collecting includes the step of collecting one or more electrical operating parameters of the device and wherein the step of automatically detecting includes the step of using the electrical operating parameters of the device to detect whether the device is operating in accordance with the voltage-current characteristic curve of the device.

31.   The method of claim 20, wherein the step of automatically detecting includes the step of using an expert engine to automatically detect the presence of cavitation within the device.

32. The method of claim 31, wherein the step of using an expert engine includes the step of using a neural network.

33. The method of claim 31, wherein the step of using an expert engine includes the step of using a trending analysis.

34. The method of claim 31, wherein the step of using an expert engine includes the step of using a fractal analysis engine.

35. A monitoring system for use in detecting the presence of cavitation within a device in a plant having a processor, the monitoring system comprising:

a memory;

a collection routine stored in the memory and adapted to be executed on the processor to collect one or more operating parameters associated with the device during operation of the device;

a monitoring routine stored in the memory and adapted to be executed on the processor to use the one or more operating parameters to estimate the presence of cavitation within the device.

36. The monitoring system of claim 35, wherein the monitoring routine is adapted to use the operating parameters to detect a degradation in the operational performance of the device to estimate the presence of cavitation within the device.

37. The monitoring system of claim 36, further including a characteristic curve associated with the device stored in the memory and wherein the monitoring routine is adapted to detect the degradation in performance based on the characteristic curve.

38.   The monitoring system of claim 37, wherein the characteristic curve is a voltage-amplitude curve.

39.   The monitoring system of claim 37, wherein the characteristic curve defines a net positive suction head required for the device.

40.   The monitoring system of claim 39, wherein the monitoring routine is adapted to determine a net positive suction head available within the device from the operating parameters and to compare the net positive suction head available and net positive suction head required to estimate the presence of cavitation within the device.

41.   The monitoring system of claim 35, wherein the monitoring routine includes an expert engine.

42.   A field device for use in a process plant, the field device comprising:
a processor;
a memory;
a collection routine stored in the memory and adapted to be executed on the processor to collect one or more operating parameters associated with the process plant operation;
a monitoring routine stored in the memory and adapted to be executed on the processor to use the one or more operating parameters to estimate the presence of cavitation in the process plant.

43.   The field device of claim 42, wherein the monitoring routine is adapted to use the operating parameters to detect a degradation in the operational performance of a device in the process plant to estimate the presence of cavitation within the process plant.

44.   The field device of claim 42, further including a characteristic curve associated with the device stored in the memory and wherein the monitoring routine is adapted to detect the degradation in performance based on the characteristic curve.

45.   The field device of claim 44, wherein the characteristic curve is a voltage-amplitude curve.

46.   The field device of claim 44, wherein the characteristic curve defines a net positive suction head required for the device.

47.   The field device of claim 46, wherein the monitoring routine is adapted to determine a net positive suction head available within the device from the operating parameters and to compare the net positive suction head available and net positive suction head required to estimate the existence of cavitation within the device.

48.   The field device of claim 42, further including a pump mechanism.

49.   The field device of claim 48, wherein the pump mechanism includes an impeller.

50.   The field device of claim 48, further including a pressure sensor.

51.   The field device of claim 48, further including a flow rate sensor.

52.   The field device of claim 48, further including a pressure sensor and a flow rate sensor.

53.   The field device of claim 42, wherein the monitoring routine includes an expert engine.